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ABSTRACT

A study investigated previous research findings that children demonstrate certain confusions about print conventions, and that above average readers perform better on measures that assess knowledge of print conventions than do poorer readers. In addition, the study measured the contribution of intelligence to both print awareness and reading achievement and tested for the presence of certain hypothesized effect sizes to more precisely define the relationship between print awareness, reading ability, and intelligence. Subjects, 62 white female and 56 white male first grade students, completed the Concepts about Print Test (CAPT), the Otis-Lennon School Ability Test, and the Stanford Achievement Test. In general, the results supported previous findings that some beginning readers' concepts of letters, words, and punctuation marks are not stabilized even after one year of reading instruction. Significant differences were found between types of readers on the intelligence measure and on items of the CAPT representing directional habits and pertaining to the identification of incorrect word and letter sequences and punctuation. While measures of reading achievement and intelligence together accounted for 40% of the variance in print awareness scores, neither accounted for a substantial amount of variance with the other statistically controlled. No sex differences were discovered on any variable measured. (Extensive tables of data are appended.) (FL)

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First Graders' Print Awareness as Related to Reading Achievement Intelligence and Gender

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Abstract

The purpose of the investigation was in part to replicate previous findings that children demonstrate certain confusions about printed conventions and that above average readers perform better on measures attempting to assess knowledge of printed conventions than do poorer readers. The study in addition set out to measure the contribution of intelligence to both print awareness and reading achievement and to test for the presence of certain hypothesized effect sizes to more precisely define the relationship between print awareness, reading ability and intelligence. Subjects for the study were 118 all white first grade students, 62 female and 56 male, from a predominantly middle class, metropolitan school district. Students were individually interviewed with the Concepts About Print Test (CAPT) during April 1982. Other measures included were the Otis-Lennon School Ability Test and the Stanford Achievement Test. In general, the study supported the findings of previous research that some beginning readers' concepts of letters, words and marks of punctuation are not stabilized even after one year of reading instruction. Significant differences were found between types of readers on the measure of intelligence and on items of the CAPT representing directional habits and pertaining to the identification of incorrect word and letter sequences and punctuation. While together measures of reading achievement and intelligence accounted for 40% of the variance in print awareness scores, neither accounted for a substantial amount of variance with the other statistically controlled. No sex differences were found on any variables measured in the study.

First Graders' Print Awareness as Related to Reading Achievement, Intelligence and Gender

Since Reid's (1966) discovery of children's confusion between such terms as "letter" and "numeral," "words" and "names," some researchers in reading (e.g., Clay, 1979b; Downing, 1976, 1979b; Mattingly, 1972, 1979) have stressed that concepts about reading, or "metalinguistic awareness" (Blachowitz, 1978; Evans, 1975), is just as crucial in beginning to read as learning letter/sound correspondences. Further, Downing (1979b) has stated that most children approach learning to read in a "state of cognitive confusion about the purposes and technical features of language" (p. 37). The intent, therefore, of the present study was to explore one aspect of metalinguistic awareness, knowledge of printed conventions, hereafter called "print awareness," and to examine this aspect taking into account the effect of reading ability, intelligence and gender.

Metalinguistic Awareness: An Extended Definition

One key to understanding the characteristics of a writing system, according to Downing (1976), is familiarity with the concepts underlying the "reading instruction register" which is "the special language used to talk about reading and its relation to speech" (p. 763). Such concepts include notions of units in both oral and written language such as "phonemes," "sounds," "letters," "words," "sentences" and of differences between the processes of "reading," "writing," and "drawing." While investigators have established that most children

develop some idea about language units and scripting early in the preschool years (Goodman & Altwerger, Note 1; Hiebert, 1981; Harste, Burke & Woodward, Note 2; Hill, 1980; Yaden, Note 3), the consensus of studies internationally, particularly with kindergartners and first graders, has been that these nascent concepts are not overwhelmingly congruent with teachers' usage of the terms (Downing, 1976).

Another area of conceptual development pointed out by Clay (1979b) is becoming familiar with the spatial orientation of letters and directionality in print. Clay has suggested that the encounter with written language is actually a unique situation in the child's overall experience.

> The child's experience has trained him in different habits from those he needs in reading. An orange, a dog, or mother must be recognized from any viewing angle. Meaning is constant when the object is small or large, is upside-down, back-to-front, or sideways to the viewer. The child has learned to recognize the constancy of objects despite their changing visual image. On entry to school he has to learn that in one particular situation, when he is faced with printed English, this flexibility is inappropriate. Now he must recognize some directional constraints. (p. 99)

In developing this "orthographic linguistic awareness" (Day, Day, Spicola & Griffen, 1981), the child must learn that print, not pictures, carries the meaning, that left pages are read before right pages, that top lines are read before bottom lines, that printed words are read from left to right, etc. Clay (1979b) has noted that these concepts are not easily grasped as it took the average child in her two

year longitudinal study of 100 children six months to gain consistency in directional behavior, and even after a year of instruction, "4 percent to 16 percent of children still show directional errors" (p. 131-132).

Finally, along with an understanding of the technical instructional terms and their referents and a realization of which direction printed language must be processed, Mattingly (1979) has stated that an "essential prerequiste" to learning to read is " 'linguistic awareness': the ability of a speaker-hearer to bring to bear rather deliberately the grammatical, and in particular, the phonological knowledge he does have in the course of reading" (p. 277). As opposed to the largely unconscious mechanisms involved in the processing of speech input, reading must be, according to Mattingly (1972), a "deliberately acquired, language-based skill dependent upon the speaker-hearer's awareness of certain aspects of primary linguistic activity" (p. 145). In other words, to process written language, the child must be "thoroughly familiar with the rules of the writing system, the shapes of the characters and the relationship of characters and combinations of characters to the phonology of his language" (p. 142). However, as Mattingly (1972) has noted, the relationship between the orthography and the spoken language is not merely phonemic as suggested by some linguists (e.g., Bloomfield, 1942), but rather "morphophonemic." The child learning to read must be cognizant that words in the spoken language are only imperfectly represented in print and that the visual symbols often correspond more appropriately to underlying semantic structures than phonemic ones as in pairs "anxious-anxiety" or "courage-courageous" where the orthography remains constant despite phonetic variation (Chomsky, 1970). Thus, Mattingly (1979) has suggested,

> To the linguistically-aware child, the phonological segmentation and the morphophonemical structure of words is intuitively obvious, and the orthography seems reasonable even though there may be substantial discrepancies between the orthographic transcriptions of words and his immature morphophonemic forms; to the child not thus aware, the principles by which the orthography transcribes words seem quite mystifying. (p. 277)

What research has discovered, however, is that the majority of children beginning to read across cultures are indeed somewhat "mystified" at the task which lies before them. While Reid (1966) studied only a dozen Scottish children using a Piagetian interview technique, the persistence of beginning readers to show an overall lack of awareness for the purposes and processes involved in reading has since been shown by a variety of both descriptive and experimental studies with American kindergartners and first graders (Day & Day, 1979; Evans, Taylor & Blum, 1979; Holden & MacGinitie, 1972; Johns, 1980; Kingston, Weaver & Figa, 1972; McNinch, 1974; Meltzer & Herse, 1969; Mickish, 1974), with Canadian and English children (Downing, 1969, 1970, 1971-72; Downing & Oliver, 1973-74; Francis, 1973; Leong & Haines, 1978), in New Zealand (Clay, 1967, 1969, 1979b; Turnbull, 1970, 1971), Switzerland (Papandropoulou & Sinclair, 1974) and across ethnic boundaries (Denny & Weintraub, 1966; Downing, Ollila & Oliver, 1975; Oliver, 1975). While a certain amount of initial uncertainty is to be expected, a disturbing finding is that children only "groped" (Reid, 1966) towards understanding these concepts very slowly and that a large number were still confused with certain aspects of printed conventions such as written word

boundaries even after a year of reading instruction (Mickish, 1974).

Metalinguistic Awareness and Reading Ability

Although in earlier studies children had been observed to lack adult notions of written word boundaries (e.g., Kingston, Weaver & Figa, 1972; Meltzer & Herse, 1969) and to confuse isolated phonemes and syllables for spoken words (Downing & Oliver, 1973-74), McNinch (1974) has correctly pointed out that these studies failed to compare awareness of printed conventions or understanding of oral language units with actual reading achievement. McNinch (1974) found that while perception of visual word boundaries differentiated between groups of first graders categorized as good, average and poor on readiness measures, it was not a significant predictor of end of year reading scores on the Metropolitan Achievement Test (1971), whereas perception of aural word boundaries had precisely the opposite relationship. Similarly, Blum, Taylor & Blum (1979) observed that some children scoring perfectly on their visual word boundary instrument still read below grade level as measured by standardized tests. Thus, the authors concluded that "while awareness of visual word boundaries seems to be related to readiness skills, this readiness skill is not closely associated with success in learning to read" (p. 37).

Other researchers as well have found that a limited conceptual understanding of technical language terms in addition to concepts of directionality does not necessarily inhibit the initial acquisition of reading. For example, Francis (1973) noted that concepts of "letter," "word," and "sentence" seem to develop sequentially with "the two latter concepts being mastered while the children were already reading" (p. 20). In addition, Day and Day (1979) discovered that the average child in their sample of beginning first graders knew

only half of the items on the Sand—the Concepts About Print Test (CAPT, 1972), a measure designed to tap concepts of directionality, knowledge of punctuation, differences between letters and words, and matching speech to print. Even children who were classified as readers by their teachers at the end of the first grade only correctly identified approximately two-thirds of the items on the instrument. Day and Day (1979) stated, therefore, that "some of the concepts assessed by this test may not be crucial for basic reading acquisition" (p. 22).

Thus, while metalinguistic abilities such as differentiating between units in oral and written language and understanding the purposes for and processes involved in deciphering visual language in its various scripted forms have been postulated as crucial in learning to read, the relationship to actual reading achievement is by no means well-defined as yet. Ehri (1979), for example, insisted that "it is a waste of time to study these capabilities in prereaders" (p. 89). In her view, the process of learning to read itself "is the significant factor accounting for the emergence of word-consciousness" (p. 69). On the other hand, Evanechko, Ollila, Downing and Braun (1973) have stated that

> to identify certain concepts pertaining to the nature of reading, the elements of the reading process (words, letters) and related environmental phenomena. . . . suggests the significance of the learner's ability to classify experiences and identify their relationships and meaning. . . Furthermore, this factor measures a unique aspect of reading readiness, that of the child's concept of the nature and purpose of reading, an aspect hitherto ignored in test [sic] of reading readiness. (p. 74)

The purpose of the present investigation was in part to replicate with a larger sample size previous findings using the CAPT that children demonstrate

certain confusions about printed conventions and that above average readers specifically because of their reading ability perform better on measures attempting to assess knowledge of print conventions. The study in addition set out to measure the contribution of intelligence to both print awareness and reading achievement and to test for the presence of certain hypothesized effect sizes (Cohen, 1977) to more precisely define the relationships between the variables. In addition, several precautions were taken as suggested by previous researchers to overcome the difficulties presented by certain items on the test. The specific questions investigated by the study were

1. What is the total as well as singular contribution of reading achievement, intelligence and gender to an awareness of print conventions?
2. Can above and below average readers be differentiated on a dimension of variables comprised of aspects of print awareness and intelligence and gender?
3. What is the proportion of common variance shared by aspects of print awareness and measures of reading achievement?

Method

Subjects

Subjects for the study were drawn from the total population of 186 first graders at two elementary schools in Moore, Oklahoma. Parent permission forms to participate in the study were sent early in April and 146 (78.4%) were returned within two weeks, 75 from one school and 71 from the other. While all 146 of the students were tested with the print awareness instrument not all of

the students' scores were used in the final analysis. Since the study did not intend to assess differences between ethnic groups, minority students' scores comprising approximately 8% of the useable sample (12/146) were excluded. In addition, print awareness results for 16 white students who had no recorded intelligence score were subsequently deleted as well. The final sample was comprised of 118 all white students, 62 female and 56 male, from a predominantly middle class, metropolitan school district.

Means and standard deviations for males and females on all variables measured in the study are displayed in Table 1. Since separate univariate analysis such as multiple t-tests or ANOVA's (analysis of variance) are inappropriate primarily due to correlations between the variables (Huck, Cormier & Bounds, 1974), a one-way multivariate analysis of variance (MANOVA) was applied to the data, comparing males and females on all variables. Results of this analysis showed the effect of gender to be nonsignificant for all measurements according to Wilk's Lambda, F (12, 105) = 0.86, p = 0.587 ~~(Helwig & Council, 1979).~~

Insert Table 1 about here

Materials

The Concepts About Print Test (CAPT) is a 24-item instrument developed by Clay (1979a) to assess a child's knowledge of print conventions such as correct book orientation, directionality of print, visual word boundaries, concepts about letters (upper and lower case), words, and marks of punctuation. It is

administered individually by reading a short narrative approximately 7-10 minutes in length to the child from either of two booklets entitled Sand (1972) and Stones (1979). On each page of the booklet, the examiner asks a question pertinent to an area of print awareness and records a dichotomous score (right or wrong) based on criterion responses for each item provided by Clay (1979a). While originally developed in New Zealand, it has been used in American homes with preschoolers (Goodman & Altwerger, Note 1) and in American schools with kindergartners and first graders (Day & Day, 1980; Johns, 1980). Day and Day (1980) reported for their sample test-retest reliability coefficients of .73 - .89 and split-half coefficients of .84 - .88. Similarly, Johns (1980), for a sample of first graders reported a Kuder-Richardson Formula No. 20 (KR 20) of .86 for males, .76 for females, and .82 for the total sample. However, the KR 20 coefficients for the present sample were considerably lower being .57 for males, .68 for females, and .63 for the overall sample.

One suspected reason for these low coefficients is the lack of variability on approximately 70% of the items on the test. Results to be discussed show that 80% and better of both males and females scored successfully on 17 out of the 24 items on the test, the large proportion of variability originating from only half a dozen or so items. Clay (1979a) herself alluded to a ceiling effect on the test which may happen with children progressing at a normal rate in reading.

> The test reflects changes in reading skill during the first year of instruction but is of less significance in the subsequent years for children who make average progress. For problem readers confusions about these arbitrary conventions of our written language code tend to persist. (p. 17)

While these first graders were in their first year of basal reading instruction, it was noted that the school district has a very strong kindergarten program which stresses focus on letter and word forms and beginning reading behaviors. Thus, it is conceivable that most of the children in the sample at the time of testing were actually in their "second" year of reading instruction and, therefore, had acquired most of the concepts to which the CAPT addresses itself. The actual number of subjects who had attended kindergarten in the district was not verified.

As a supplement to the above argument for low reliability, Day, Day and Hollingsworth (Note 4) reported their higher test-retest reliability coefficients for the three administrations during the kindergarten year and one testing at the beginning of the first grade when the children were less sophisticated in their knowledge of print conventions and showed greater variability. They have reported, however, lower test-retest coefficients between administrations of the CAPT at the beginning of kindergarten and end of first grade (.67 for males and females) and between a second administration (Nov./Dec.) during the kindergarten year and end of first grade of .63 for males and .61 for females. As Van Dalen (1979) has pointed out, test-retest reliability is severely affected by either experiences or maturation which influences performance on the particular test (p. 139). As Day's and Day's (Note 5) data showed, for instance on item 3 for beginning at the top left of the page, at the beginning of kindergarten only 51% of their sample had acquired this knowledge; whereas at the end of first grade, 98% were familiar with this convention. Thus, for the present study, the relatively low reliability is imputed to the prior familiarity of a majority of the sample with print conventions as measured by the test, rather than to inconsistencies within the test itself.

Scores were also obtained from a school administered Otis-Lennon School Ability Test (OLSAT, 1979). The test is a group-administered test of "general reasoning ability" involving the capacity "to deal with abstract relationships involving the manipulation of ideas expressed in verbal, numerical, figural and symbolic form" (p. 14). It provides a single, standardized measure (School Ability Index) of performance with a mean of 100 and standard deviation of 16. A test-retest coefficient of .84 for a fall-spring administrations was reported in the norming manual for first grade. Reliability coefficients were not computed for the present sample.

Measures of reading achievement were also obtained from a school administered Stanford Achievement Test, Primary I (SAT, 1973). In addition to Mathematics and Listening subtests which were not used, it is comprised of subtests on Vocabulary, Word Reading, Paragraph Reading and Word Study Skills. The total reading score is the sum of scores from the Word and Paragraph Reading plus Word Study Skills. The norms booklet reports KR 20 coefficients for the subtests of Vocabulary, Word Reading, Paragraph Reading and Word Study Skills of .86, .94, .95, and .93 respectively. Present sample reliabilities were not obtained. In order to ensure the maximum variability of reading measures, raw scores were used in all analyses.

Design and Analyses

The design of the study was correlational in nature with several multivariate relationships measured and statistically manipulated. The first of these statistical procedures involved a multiple regression analysis of the criterion variable, print awareness, as measured by the CAPT on the predictor variables of Word Reading, Reading Comprehension, Word Study Skills and Vocabulary as

measured by subtests of the SAT. Included in the multiple regression also as independent predictor variables were the "School Ability Index" from the OLSAT and gender (coded "1" for males, "0" for females). Following the multiple regression, partial correlations were first computed between print awareness and each of the reading subtests with intelligence controlled. The next set of partial correlations involved the relationship between print awareness and intelligence with each of the reading subtests controlled.

The second multivariate procedure conducted was a one-way MANOVA designed to assess whether or not above and below average readers could be distinguished by their scores (item total) on four previously identified factors (Note 5) within the CAPT: (a) Book Orientation, (b) Print-direction, (c) Letter/Word and (d) Advanced Print Concepts. The "School Ability Index" of the OLSAT was included as a discriminating variable also. For the present study, above and below average readers were defined a priori as falling above the 55th percentile on total reading or below the 45th based on total reading scores from the SAT. By removing the middle decile, a sample of at least 100 ($\underline{N}$ = 103) was preserved for the sake of power, while still creating distinct, separate groups.

The last analysis performed was a canonical correlation, a multivariate procedure in which more than one dependent variable, conceptually related as a set, is correlated with multiple independent variables also conceptually meaningful. In the present study, the dependent variables analyzed were the four concept scores of the CAPT and the independent included the four reading subtests of the SAT. The statistical procedure is designed to maximize the correlation between the two sets of variables (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975). All statistical analyses were carried out via the Statistical Analysis System (Helwig & Council, 1979).

For the multiple regression, statistical power was calculated from tables by Cohen (1977) to be between .985 - .995 for finding a proportion of variance of .26 accounted for in print awareness by measures of reading achievement and an explained variance of .13 accounted for by the measure of intelligence with α = .05, N = 120. Proportions of .26 and .13 of explained variance in print awareness are considered by Cohen (1977) to represent "large" and "medium" effects respectively. These amounts of variance were chosen by the writer to represent the minimum contribution that variables of reading and intelligence should make apart from the influence of the other before their influence could be considered pragmatically significant.

Procedures

Using the booklet Stones (1979), the CAPT was administered individually following the protocols specified by Clay (1979a). In one school, the children were tested outside their classroom in the hall while in the other, the examiner used a nearby empty classroom. The interview took approximately 7-10 minutes and all children seemed to enjoy having the story read to them. Data were collected during the week of April 5th for the first school and during the weeks of April 12th and 19th for the second. The data sheets were then turned in to a school district secretary who recorded the OLSAT and SAT scores in appropriate places on the data sheets and then gave them back to the writer with the names of the children deleted.

Johns (1980) noted several variations in responses for particularly the items probing knowledge of punctuation marks. One seemingly anomalous response recorded in the present study was that a period denoted, as one child said, "Not getting excited" or as another confidently stated, "Talking plain." More

commonly the response was that a period specified a "telling" sentence. After discussing with the teachers the actual instruction given the children on punctuation marks, they confirmed that the children had indeed been repeatedly told that a period meant an absence of excitement in addition to the more common instruction that it denoted the end of the sentence. Responses therefore to item 16 such as recorded above were counted as correct answers for the function of a period.

Johns (1980) noted as well that some of the children in his sample did not seem to understand the task required to answer items 21-24 which entailed blocking out single letters and words with a pair of index cards. Johns (1980) suggested that perhaps having the children point to examples of letters and word units might provide more accurate responses. In the present investigation, therefore, children were told that they could either point to the particular units or use the cards to isolate them on the page. Interestingly, most of the children used the cards and did not demonstrate the particular difficulty that Johns (1980) observed in his sample.

A final observation made by Johns (1980) involved items 12-14 which require the child to identify letters and words which are reversed on the page. The question posed by the examiner ("What's wrong on this page?") does not direct the child's attention to the print specifically, hence many of his subjects' responses reflect some activity as inferred from the picture. To avoid this, the present examiner used the question protocol for item 14 which is "What's wrong with the writing on this page?" for items 12 and 13 to coerce the child to focus on the printed lines rather than the picture. Interestingly, however, this procedure apparently did not enhance responses appreciably because most

children continued to offer explanations based on the picture as will be seen in the findings, next to be discussed.

Findings

The results of the study will be presented in two parts. First, a descriptive summary of the percentages of correctly identified CAPT items by factor pattern for the whole sample will be given as well as a brief discussion and presentation of the item percentage breakdown for males and females. Secondly, the statistical analyses directly bearing on the problems examined by the study will be discussed.

Book Orientation Concepts.

Table 2 presents the percentage of subjects correctly answering each CAPT item. While six children (5%) in the present sample responded incorrectly to item 1 where the examiner asked, "Show me the front of this book," the confusion seemed more to be with the test prompt than with knowing the actual answer. Of the six indicating something other than the front cover, three pointed to the first page of print, two at the adjacent picture and one merely looked at the examiner and gave no response. It appeared that at least five of the six children knew where the story began and were perplexed at the ambiguity of the term "front," meaning perhaps "first" or "beginning" of the story. Hesitation to respond immediately to this initial question was noticed with a number of other children who looked quizzically at the researcher and often times flipped the book over and back again as if looking for something to divert them from the too obvious answer. Clearly, for the majority of these children, the question appeared as a "trick" rather than a probe of actual knowledge.

Insert Table 2 about here

Print-direction Concepts.

All children in the study demonstrated correct directional habits and only two (a boy and a girl) showed difficulty in pointing to each word of text (item 6) as it was being read by the examiner. The same boy and another girl missed item 7 which required the identification of the "first" and "last" part of the story on one page. Interestingly, two out of three of these children missing item 6 and 7 had total CAPT scores which were at least one standard deviation (2.24) below the mean for the total sample (18.7). Thus, unlike the students missing item 1, the ones missing these latter items (6 & 7) seemed to be showing real difficulties in processing print.

While five children responded incorrectly to item 9, recognizing inverted print, four of the five stated that the print was indeed "upside-down." However, when prompted to indicate which direction it should be read, all underscored the print with their fingers, moving left to right. Whether or not the children were exhibiting a fundamental confusion seems in doubt since all of them scored perfectly on items 3-6, thus indicating correct movement on normally oriented print. However, while the majority of the sample (96%) readily turned the book upside-down or moved from right to left, these few children seemed "normal print bound," in the sense that normal left-to-right directional habits were applied "generically," mutatis mutandi, regardless of the spatial orientation of

the letters and words. This confusion, however, should not be considered noteworthy in light of the prior performance with regular print. The misunderstanding, it seems, is rather generated by the test presentation of the special case of print and not because of uncertainty in reading common sequences of graphic arrays in the environment or books.

Identification of the name and/or function of the period (item 16) seems incongruous with the rest of the items included in Print-direction Concepts. However, the writer discussed this with the first author (Note 6) of Day and Day (Note 5), and though the latter agreed that it made intuitive sense to include it with other punctuation items, the factor analysis did not support its removal from the other related items in the Print-direction cluster. Therefore for this reason, the present study maintained the integrity of the original factor analysis patterns.

On item 16, most of the children responded to the question "What is this for?" by saying, "For ending" or "For stopping." However as mentioned earlier, a large proportion stated that the period was for "telling." A brief sampling of the first grade teachers revealed that this response was in line with the current mode of instruction which stressed voice inflections as accompanying each question, period and exclamation point. The most common response of the 17 students (14%) who answered incorrectly was "Can't remember."

Letter/Word Concepts

Item 8 which required the child to recognize an upside-down picture was one of the least stable variables in the original factor analysis (Note 5) and according to Day (Note 6) probably could have been included under Book Orientation Concepts without disturbing the factor structure. However for the

sake of replication, it too was left with its original group of correlated items. Only one child out of the total 118 failed to point out the "bottom" of the picture (indicated by pointing to the top of the page). However, a number of children hesitated slightly and began to point to the bottom of the page (top of the picture initially). This item as well as item 9 (inverted print) elicited an initial puzzlement as to how to respond and may, for older children in particular, generate incorrect responses that are test specific and not reflective of real misunderstanding.

Over 90% of the sample was able to correctly distinguish between one and two letters and one and two words. Yet, eleven children on item 21 and seven on item 22 did equate letters with words and frequently divided words at places other than space boundaries. For example, when asked to block out one and two letters, several showed one and two words. When asked follow-up questions as to what he was indicating, one child responded, "down and rolled down" (the test sentence read: The stone rolled down the hill.). Another child, identifying one and two words, blocked out "led dow" and "lled down." Of the children who incorrectly identified the first and last letter of a word (item 22), most showed whole words, usually the first and last words of the sentence "The stone rolled down the hill." Yet, the confusion was not so much with the concepts of "first" and "last" as much as with equating words with letters. Thus, a fundamental confusion of equating letter with words and dividing words at places other than space boundaries was documented in the present sample with children ending at least nine months of concentrated reading instruction.

Advanced Print Concepts

For this conceptual dimension comprised of items 10, 12, 13, 14, 15, 17, 18, and 20, the sample exhibited considerably better performance in recognizing top

and bottom lines which had been reversed (item 10)

and kicked it very hard.

I swung back my foot

than in recognizing inverted word sequences (e.g., "Then I stood my on toes and I and watched.") or letter sequences (e.g., "The stone rolled down eth hill, bumping thsi way and that."). An insightful response of the several of the children who didn't indicate that the lines were reversed was either that "and" wasn't capitalized or that there was not a period after "foot." In other words, for these children, one line of print, beginning with a captial and ending with a period, constituted one written sentence. And any lines not conforming to this pattern were "wrong" in the child's eyes. One of the teachers confided to the examiner later that even though the basal test in use contained primarily one-line sentences, all of the teachers stressed to the children that written sentences could be more than one line of print. Interestingly, however, for this item the childrens' incorrect responses seemed more conditioned by the sentence style of the basal test rather teacher admonition.

Items 12, 13, 14 for the present sample proved to be the most difficult as over 80% of the children did not recognize inverted word or letter sequences. Knowing that responses to these items were often semantic, referring to the story line and/or pictures, the writer purposely prompted the children on these items with the question "What's wrong with the writing on this page?" to focus attention on the print. Despite this precaution, however, many of the children gave the semantic responses of "down to the flowers that are yellow" or "go on to the bend," referring to the where the rolling stone in the picture was eventually headed. The poor performance on these items (12, 13 & 14) was

somewhat surprising for the present subjects since a heavily synthetic phonic approach is taken by the current basal series in use. It should be also noted that neither words with letter switches at the beginning or end (e.g., "eth," "thsi," "tsop") produced any better performance than switches in the middle (e.g., "huose" and "yelolw"), even though it is commonly observed that initial and final letters of words are more salient to children than medial ones. Even though the present examiner attempted to constrain the subjects' attention more than in previous studies, it was obvious that most children were looking at the picture rather than print in forming their answers. Therefore, the low performance of all children in the present study may not be entirely indicative of their ability to sight read or track sound in words.

For the items asking for identification of various punctuation marks (i.e., 15, 17, 18), approximately one third of the children identified commas and quotation marks equally as well while three quarters of the students knew the function of the question mark. And reversible words (e.g., "was/saw," "no/on") were distinguished by 86% of the sample.

Table 3 shows the percentage of correctly identified items broken out by gender. Differences in the sample at hand between boys and girls, excepting item 10, were very small with 12 out of the 15 items favoring girls reflecting a difference of less than or equal to only 5%. Only item 10 produced any noticeable difference in performance (17%). The current investigation found no significant differences between the means for males (18.48) and females (18.98) on performance for the entire test, $\underline{t}\,(116) = 1.22$, $\underline{p} > .05$.

Insert Table 3 about here

Correlations Between Variables

In Table 4 are displayed the zero-order correlations for all variables measured in the study. Of the 78 possible correlations, 47 (60%) are significant at α = .05 and 39 (50%) at α = .01. However, with a sample this large, significance is reached with correlations above $\pm$ .181 (α = .05) and $\pm$ .236 (α = .01). It can be seen that many of the lower correlations occur between the four concept scores of the CAPT, none being above .244. This would seem to indicate that the four groups of items identified by the original factor analysis (Day & Day, Note 5) are relatively distinct from one another, measuring different print awareness abilities. Both Print-direction and Letter/Word concept scores, however, have moderate correlations with the total CAPT score (.489 and .549 respectively) and the Advanced Print coefficient (.906) is very high. Thus, for the present sample, performance on the Advanced Print items accounts for over 80% of the variance in total print awareness ability as measured by the CAPT.

Insert Table 4 about here

As expected, the subtests of the SAT correlate, for the most part, very highly among one another and with the Total Reading score. Of particular interest to this study is that the reading subtests all correlate more highly with the total print awareness score than does the intelligence measure. Of further interest is the fact that the correlations between Advanced Print Concepts and the reading subtests are nearly the same as the coefficients between the latter

and the total print awareness score. This seems to indicate that of the variety of print awareness abilities tapped by the CAPT, only the items representing Advanced Print Concepts (noting incorrect letter and word sequences and distinguishing punctuation marks) share substantially the same abilities and knowledge as measured by this particular standardized reading test (SAT).

Contributions of Reading Achievement and Intelligence to Print Awareness

The first problem investigated was the individual and joint contributions of measures of reading achievement, intelligence and gender to print awareness ability. This was accomplished by means of a stepwise multiple regression which selected the independent variables one by one for inclusion into the regression equation. In the particular statistical procedure used, all possible combinations of independent variables were compared with one another in order to produce the "best" one, two, three, etc. variable model explaining the variance in print awareness scores.

Table 5 displays the "best" two, three and four variables models accounting for the largest possible R^2 for each combination of independent measures. The associated F-values for each variable indicate whether or not that variable's removal from the model would constitute a significant loss in explained variance. The first F-value in each subtable represents the ability of the overall combination of variables to account for the variance in print awareness as opposed to chance.

Insert Table 5 about here

As can be seen from the Table 5, Word Reading and intelligence (Otis-Lennon) both account for a significant amount of explained variance in print awareness and represent the "best" two variable combination. Even with the addition of Vocabulary (three variable model) and Word Study Skills (four variable model) the contributions of both Word Reading and intelligence remain statistically significant beyond $\alpha = .05$. Due to the high correlations between all the reading subtests (see Table 4), the addition of Reading Comprehension to the regression equation did not effect a significant increase in $\underline{R}^2$ (.399) from the four variable model (.395). The amount of additional variance explained by inclusion of the last variable, gender, was also trivial. The total amount of explained variance accounted for in print awareness by the total combination of the reading subtests, intelligence and gender was slightly over 40% ($\underline{R}^2 = .401$).

Partial Correlations

In Table 6 are displayed the zero and first order partial correlations of the CAPT with each of the SAT reading subtests. In the column under "first order" are listed the partial correlations when intelligence (Otis-Lennon) is held constant. (Since the correlation of gender with all other variables was nonsignificant, only intelligence was controlled.) After each column of correlation coefficients is listed the explained variance in print awareness. According to the original significance criterion of 26% of the variance in print awareness being accounted for by measures of reading achievement, all measures of reading ability, if taken singly in a bivariate correlation with print awareness will exceed this level. However, when the effect of intelligence is partialed out, the variance percentages drop considerably below the acceptable significance level for a "large" effect.

Insert Table 6 about here

Similarly, as displayed in Table 7, intelligence if taken in a bivariate correlation with print awareness scores will account for 23% of the variance which exceeds the criterion level of significance (13%) for a "medium" effect size. Yet when the overlapping correlations of each of the reading subtests are considered, the explained variance percentages drop even more drastically than when intelligence is held constant. This differential drop in explained variance between when intelligence is held constant and when reading achievement is controlled is taken to mean that factors involved in reading ability share more in common with concepts of print awareness than do aspects of abstract reasoning ability.

Insert Table 7 about here

For the present study, therefore, null hypotheses that measures of reading achievement would not comprise a statistically significant proportion of the variance of print awareness with intelligence controlled and that intelligence would not comprise a statistically significant proportion of the variance in print awareness with measures of reading achievement held constant were not rejected based on specific hypothesized effect sizes.

Comparisons Between Above and Below Average Readers

Groups of above and below average readers were created by a median split in which the middle decile (45th to 55th) of total reading scores (the sum of Word Reading, Reading Comprehension and Word Study Skills) was deleted from the subsequent analysis. This resulted in a loss of 15 students and resulted in a final N of 103, with 52 in the above average reader group and 51 in the below average group.

Results of the one-way MANOVA revealed a significant difference between the two groups of readers for the variables as measured according to Wilk's Lambda, F (6, 96) = 8.74, $p < .001$. As can be seen from Table 8, subsequent t-tests show the means for Print-direction, Advanced Print and intelligence to be all significantly different from one another. The effect of gender upon type of reader was analyzed separately in a 2 x 2 contingency table by an independent samples chi-square test. The obtained χ^2 = 1.17, df = 1, however, was not significant at α = .05 for the effect of gender upon type of reader.

Insert Table 8 about here

While the present study did not compare types of reader on specific items, from Table 2 (p. 59) it should be noted that performance on items 3, 4, and 5 under Print-direction concepts was 100%. Variation on this concept measure for the current subjects comes from items 6, 9, 7 and 16, the latter accounting for most of it. Means for both Advanced Print Concepts and the OLSAT, however, show more distinct performance differences. Above average readers seem better able to recognize incorrect letter sequences in words as well as identify the marks of punctuation. Interestingly, the large disparity in the intelligence measure between the groups approaches the standard deviation (16) for the

OLSAT and must necessarily qualify the differences between types of reader in print awareness ability.

Correlation Between Print Awareness Abilities and Reading Achievement

The final analysis carried out was a canonical correlation relating the four concept scores of the CAPT as a conceptually meaningful set with the reading subtests of the SAT. Canonical correlation provides not only an overall correlation between the two sets of variables but also ascribes standardized regression coefficients to all criterion and predictor variables, thus giving the researcher insight into which variables contribute most to the relationship.

The results of the analysis are shown in Table 9. The first and only significant canonical correlation computed between the two sets of variables is .634, representing a shared variance of 40% between the measures of print awareness and reading ability. According to the standardized weights of the reading subtests, Vocabulary (.308) contributes most highly to the relationship with print awareness followed by Word Reading (.293), Reading Comprehension (.287) and Word Study Skills (.278).

Insert Table 9 about here

While the contribution of Book Orientation is very trivial (-.061), Print-direction and Letter/Word Concepts each contribute a small amount to the relationship with reading abilities (.266 and .133, respectively). However, the standardized regression weight on Advanced Print (.859) indicates that performance on this subtest determines the relationship almost entirely. This

result was anticipated before in the correlation matrix as each of the subtests of reading correlated substantially only with Advanced Print scores out of all the concept measures (excluding the total CAPT score). It seems, then, that certain print awareness abilities as measured by the CAPT share more in common with measures of reading achievement that do others.

Limitations of the Study

While the sample size of the present study was twice as large as previous investigations using the CAPT, the nonrandomly selected sample of white, middle class students precludes any generalization to other socioeconomic levels although differences in metalinguistic abilities have been noted elsewhere between groups varying in socioeconomic status (e.g., Downing, Ollila & Oliver, 1977). Also the deletion of students of other ethnic origins further limits the generalizability of the results (c.f., Downing, Ollila & Oliver, 1975).

Another limitation stems from the low reliabilities obtained for the present group of subjects. While higher reliabilities have been obtained in samples half the size of the present one, the fact that those reliabilities were not supported in a large sample does not confirm the reliability of the CAPT with American first graders. Therefore, further investigations need to be conducted to establish a consistent pattern of reliability before definitive statements can be made about the discriminating power of the test with lower elementary students. In addition, the present study is the only one of which the writer knows that used the most recent edition of the CAPT, Stones (1979). Previous investigations (Day et al., 1981; Hollingsworth, 1978; Johns, 1980) used the Sand (1972). While there is no reason to believe that the parallel forms differ greatly, only further

research using both editions can shed light upon any differences between the two which could affect reliability adversely.

A further limitation noted also by other researchers (e.g., Johns, 1980) is that some of the items which require the children to identify incorrect letter and word sequences do not appear to engage the subjects' visual attention in order that the task might be done adequately. Although the present examiner used a specific prompt for each item (12, 13, 14) which directed the children's attention to the "writing," the majority of the students gave responses which indicated that they were looking at the pictures. It is only barely conceivable, but not impossible, that the children interpreted "writing" as drawing" (c.f., Reid, 1966) and, thus, believed that they were performing the correct task by interpreting the pictures. However, unless a test prompt is used which directs the children's attention to specific words or lines such as "What's wrong with the words (letters, lines) on this page?", it is impossible to know whether or not the large majority of children in this study as well as previous ones were truly unable to recognize incorrect sequences of words and letters. Future researchers using the ~~Sand~~ CAPT need to explore different ways to make sure that the students are focusing upon the print and not the pictures. To date, this has not been done reliably.

A final limitation is that the CAPT is wholly a measure of "orthographic linguistic awareness" (Day et al., 1981). Metalinguistic ability as suggested by the literature includes knowledge of spoken language units as well as insights into the varied functions of and purposes for literacy behaviors. Knowledge of print conventions or "orthographic factors" (Holdaway, 1979) comprises only a small part of the whole and, according to some researchers (Evans et al., 1979; McNinch, 1974), is a relatively poor predictor of actual reading ability.

Discussion

Given the limitations as mentioned earlier, definite trends in the data can be observed. While the overall differences in performance between males and females is nonsignificant for the print awareness measure as a whole, girls performed slightly better on 15 out of 24 items. This result is comparable to those of Day, Day, Hollingsworth and McClelland (1980) who found differences between boys and girls on 20 out of 24 items (see Table A, Appendix A). Even though for the present sample the difference in correctly answered items between sexes was very small, less than 5% in most cases, a pattern of difference favoring girls noted in previous investigations using the CAPT was confirmed in the present study.

Performance on the CAPT for the entire sample also indicated misunderstanding and confusions identified previously in the literature. First of all, a small percentage of children still equated letters with words or failed to recognize spaces as a visual word boundary. When asked to identify individual letters, 9% of the sample pointed out whole words and combined the last part of a word with the first of another to indicate one word. In addition, 8% of the first graders when asked to identify the first and last letter of a word, for the most part, chose the first and last word in the sentence.

Thus, within the present sample, there seems to be a group of children still confused as to the visual representation of a word and letter which may indicate a prior conceptual difficulty with these items. It is probably safe to say that the terms "word" and "letter" are certainly two of the most ubiquitously used technical descriptors in first grade reading instruction. However, sheer

frequency of utterance in the classroom may not be effective in helping children understand how these labels represent elements in the spoken and written language.

The results on the items comprising Advanced Print Concepts are more difficult to interpret. While some authors have stressed that phonemic analysis alone can be used to distinguish good and poor readers, it is not certain that the lack of proficiency in detecting incorrect letter and word sequences on the part of the present subjects is indicative of inadequate word analysis skills. Although a significant difference was found between above and below average readers on these items (12, 13, 14), the mean of the former group was 4.23, only half of the possible score. The fact that over 80% of the present sample of first graders, good readers included, did not notice incorrect letter and word sequences raises the strong possibility that poor performance on these items, observed by other researchers as well (see Table B, Appendix B), is an artifact of the test design. Until, however, a way is discovered which assures that the children are indeed scanning the lines of print, it is not possible to reliably tell how well these items discriminate between types of reader.

Another area of possible concern about the test validity resides with the four items (15, 16, 17, 18) requiring identification of punctuation. In the present sample, the period and questions mark were familiar to the majority of children (86% and 75%, respectively), while the comma and quotation marks were identifiable only to about a third (33% and 34%, respectively). However, a correct answer to the test question "What's this for?", as the examiner points to or traces the appropriate mark, can either be the name of the mark or some statement of its function (Clay, 1979a, p. 18). Some children readily giving the

name of the mark (and thus given credit for a right answer) could not precisely identify its function. For example, one student when shown a comma quickly replied, "comma." Yet, when asked follow-up questions to further specify what the mark meant in reading, she replied, "I forgot." However, since the scoring standards allow for a name to qualify for a right answer, a number of children have the "appearance" of knowledge of punctuation who in actuality have no functional grasp of what constraints the marks impose on the written language.

In addition, it was somewhat amazing to note the variation in answers to items requesting identification of punctuation. For instance, a period meant for different children, "just say it," "make your voice go down," "telling," "don't get excited" and "talking plain." The comma was variously specified as meaning "like you stop, but not really," "take a breath," "stop and go," "pause a second," "pause a minute" and "slow down." All of the aforementioned responses, it should be mentioned, were counted as correct after checking with the teachers as to the kinds of instruction delivered and responses that were acceptable in the classroom. Some of the incorrect responses, however, were just short of mystifying as one child thought the comma meant to "wink" while another stated that it meant the words were "locked in." Similarly, quotation marks to one boy were "like bunny ears" and the question mark to one child signified "entertainment." Most of the incorrect responses fortunately had to do with the child either not remembering the name or function of the mark or confusing the names and functions between the four marks.

Aside from problems with the items themselves, the individual marks carried no unitary interpretation. Just as children have varying ideas of what constitute words and letters, so apparently do they vary in their perceptions of

the functions of punctuation. While ultimately it is doubtful that a misunderstanding of punctuation will greatly retard reading, the confusion and varying perceptions are merely symptomatic of the larger phenomenon in the classroom that intensive reading instruction, per se, does not assure that a single set of rules, guidelines or processes supported by a particular teacher or text have the same interpretation for all children. As evidenced by the present sample, there is literally a metalinguistic "milieu" in the classroom comprised of varying views of letters, words, punctuation marks, etc. through which the children must pass before finally attaining adult notions of these elements. While most do this successfully, there is a small percentage in whom incorrect ways of processing print become entrenched. Therefore, while it is at first glance amusing that a child may "wink" when seeing a comma or think of "bunny ears" when seeing quotation marks, after a year of reading instruction, it should alert the teacher to possible difficulties that the child is experiencing in negotiating print conventions.

Of primary interest to the study was the comparison between above and below average readers and the contribution of reading achievement and intelligence to the measure of print awareness. It was determined beforehand that if reading ability was indeed the "spur" to increasing print awareness as theorized by some, then measures of reading ability should show a "large" effect upon print awareness scores, comprising at least 26% of the variance with intelligence held constant. If, on the other, hand, intelligence was a primary contributor, it was predetermined to have at least a "medium" effect, accounting for 13% of the variance in print awareness independent of reading ability.

Analysis of the results showed that neither variable, reading ability nor intelligence, had the hypothesized effect with the other's influence partialed out.

With intelligence controlled, measures of reading ability individually accounted for less than 20 percent of the variance of print awareness (see Table 6). And the influence of intelligence on print awareness with reading controlled was less than 10% of the variance (see Table 7). Interestingly, with a sample size as large as in the present study, despite not meeting the hypothesized criteria of pragmatic significance, all of the partial correlations were statistically significant. It can be said, then, that while actual reading ability and intelligence contribute less than substantially to the variance of print awareness scores, they are "better-than-chance" predictors of knowledge of print conventions, although less so than what was originally expected. This relationship was borne out by the regression analysis which showed that in combination, reading ability and intelligence accounted for nearly 40% of the variance in print awareness (see Table 5), contributing together a substantial amount of explained variance.

In support of the finding by some investigators that better readers demonstrate more competence in metalinguistic ability than poor readers, the present study does offer positive evidence. Above average readers were shown to be superior in knowledge of Print-direction Concepts, Advanced Print Concepts, but also intelligence as well. This study did not support, however, the difference between types of readers for Letter/Word Concepts nor for the effect of gender. Both types of readers were able to distinguish, for the most part, between one and two letters and one and two words. As previously mentioned, though, knowledge of visual word boundaries has been found to predict readiness scores more successfully than end of the year reading achievement.

Due to differences in intelligence found in the sample between above and below average readers, differences in metalinguistic ability between groups of

readers in studies which did not measure intelligence should be viewed with caution. Given the sharp decrease in the correlation between print awareness and reading with intelligence held constant, to say that reading achievement is the sole determiner of differences in print awareness or other metalinguistic abilities is inaccurate.

It is further suspected that differences in Print-direction ability is primarily due to variation in item 16, knowledge of the period. The mean for item 16 (.80) for below average readers was the only one in the concept group less than .94. Similarly, for above average readers, it was the lowest as well (.90). Further comparisons with different item groupings are planned.

Differences between readers were also noted for Advanced Print concepts which included items requiring the recognition of incorrect letter and word sequences and identification of the comma, question and quotation marks. While the mean for above average readers was only half of the possible score for this group of items, still they demonstrated a familiarity with punctuation and an ability to scan lines and words that below average readers did not. Interestingly, the weighting of Advanced Print (.859) in the canonical correlation indicated that performance on these items is responsible for most of the relationship with measures of reading ability. This is logical, however, as two of the four weighted subtests of the reading measures, Word Reading (.292) and Word Study Skills (.278) require the child to make discriminations between words with similar letter groupings (e.g., "jet," "jump", "just"). It follows, then, that students with high scores on these reading subtests would do well on similar items of the print awareness test. There is still some question, nevertheless, that the test itself does not construct the task for items 12, 13, and 14 such that all readers are given

a fair opportunity to perform up to their ability. Thus, above average readers' superiority at this point must still be taken with qualification.

That Vocabulary, a measure of "verbal competency independent of reading ability" (SAT, 1973), had the highest weighting (.308) in the canonical correlation for the total sample, however, was not anticipated. This occurrance, coupled with the fact that Vocabulary had the highest bivariate correlation (.563) with intelligence among the subtests of reading, seems to indicate that a general intellectual or language ability perhaps still comprises a portion of print awareness, even though intelligence as measured in this study did not substantially contribute to the measure of written language awareness. This relationship of vocabulary to a knowledge of printed conventions is perplexing and further investigations to explore the relationship are being planned.

Conclusion

The purpose of the investigation was, in part, to replicate with a larger sample size previous findings using the CAPT that children demonstrate certain confusions about printed conventions and that above average readers, specifically because of their reading ability, perform better on measures attempting to assess knowledge of print conventions. The study also assessed the contribution of intelligence to both print awareness and reading achievement and hypothesized certain effect sizes to more precisely define the relationships among the variables. In addition, certain precautions were taken as suggested by previous researchers to overcome the difficulties presented by certain items on the test.

In general, the study supported the findings of previous research that some beginning readers' concepts of letters, words and marks of punctuation are not

stablilized even after one year of reading instruction. It was also found that above average readers had better performance on items purporting to measure directional habits with normal and irregular print, and items pertaining to the identification of incorrect letter and word sequences and marks of punctuation. The study did not confirm, however, the hypothesized individual effects of reading achievement and intelligence. Neither one can be said to contribute substantially to the relationship with print awareness independent of the other. In combination, however, measures of reading achievement and intelligence are useful predictors of knowledge of print conventions.

Further, it would be a mistake to heed Ehri's (1979) contention that concern about metalinguistic abilities is a "waste of time" (p. 89). In the present study, the "best" predictor among reading achievement measures, Word Reading, accounted for less than a third of the variance in print awareness not considering the overlapping correlation of intelligence. Thus, high reading achievement alone does not ensure that a child will fully understand the terms in the "reading instruction register" nor understand the more esoteric refinements that punctuation adds to written language. Similarly, there is no guarantee either that a child with superior intelligence will discover on his own the technical features of print. Clearly, neither reading achievement nor intelligence as measured by the present study is sufficient in and of itself to explain knowledge of print conventions as assessed by the CAPT.

Recommendations

A limitation imposed upon the present study was the low reliabilities obtained by use of the most recent edition of the print awareness instrument.

Rather than inconsistencies in the test itself, it was suggested that the sample as selected was familiar with most of the printed conventions as presented, thus reducing the variability throughout the test and concentrating it only within a few items. Since this is the first usage of the Stones (1979), other investigations need to be carried out to confirm, or disconfirm, the reliabilities and results obtained in this study. A preliminary recommendation, however, is that the test is more appropriately used at the beginning or end of kindergarten than at the end of first grade.

A further recommendation involves either a change in the examiner's questions for items 12, 13 and 14 (identification of incorrect word and letter sequences) or appropriate follow-up activities which confirm the responses elicited on these items. There is good reason to believe as suggested by this study and others that the student's attention is not focused on the lines of print containing the reversed word and letter sequences. This was evidenced by the high percentage of semantic responses (i.e., referring to the picture) obtained in this study even among above average readers. One suggestion might be to either have the child point to each word as the examiner reads it or to run a finger under the lines of print while scanning silently. In this manner, one can be surer that all of the children at least have the opportunity of focusing on the print initially before giving an answer.

Another suggestion regarding actual test administration is that responses for the items dealing with punctuation should be verified for a knowledge of function, rather than just the name of the mark. It was found in the present study that several children who knew the names of the various forms of punctuation could not readily explain their effects on the written text. Thus, if

the child first responds to the examiner's question "What is this for?" by giving the name of the mark, follow-up questions such as "What does that mark tell you to do?" or something similar needs to be asked before the response to the item is considered correct.

A recommendation for future research is the further exploration of the notion that print awareness ability might be "text-governed" or specific to the style of instructional material. In the study at hand it was observed that children's notions of the nature of a written sentence seemed to be influenced by the sentence length in the basal reader rather than the placement of punctuation. It has been noted by others that children's perceptions of words may also be influenced by texts using mostly one-syllable words. Therefore, a question that future research needs to answer is whether or not various kinds of printed language styles such as simple vs. complex sentence structure or monosyllabic vs. polysyllabic texts can produce real differences in print awareness during the first few years of learning to read.

In conclusion, despite the few difficulties of administration, the CAPT seems to render more useful information about actual reading behavior than most traditional readiness tests whose profiles are more general. In contrast, the CAPT gives a specific indication of whether or not a child understands the direction in which print should be processed, the difference between letter and word units, the function of punctuation and the concept that separate letter clusters each represent spoken words. These and other aspects of reading covered by the test offer the classroom teacher very detailed information of what a child knows about deciphering written messages. Further, given the minimal time involved in administration (7-10 minutes), the CAPT potentially

represents in this writer's view, one of the more productive diagnostic instruments yet devised for assessing pre- and early reading behavior.

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Table 1

Means and Standard Deviations for Males and Females

Variable	Males (N = 56)		Females (N = 62)		Total (N = 118)	
	M	SD	M	SD	M	SD
1. Age	84.42	4.26	83.91	4.47	84.16	4.36
2. Otis-Lennon	105.28	14.49	109.75	13.76	107.63	14.23
3. Total Reading[a]	107.14	26.12	112.32	23.99	109.86	25.05
4. CAPT Total	18.48	2.09	18.98	2.35	18.74	2.24
5. Word Reading	31.46	9.30	32.25	9.10	31.88	9.16
6. Reading Comprehension	26.44	10.61	29.93	9.50	78.27	10.10
7. Word Study Skills	49.19	7.71	50.12	7.50	49.68	7.59
8. Vocabulary	25.40	4.91	26.35	4.30	25.90	4.60
9. Book Orientation[b]	2.91	.28	2.96	.17	2.94	.23
10. Print-direction	6.75	.54	6.80	.47	6.77	.50
11. Letter/Word	5.64	.72	5.69	.73	5.66	.72
12. Advanced Print	3.16	1.61	3.51	1.80	3.34	1.72

[a]Total Reading equals the sum of Word Reading, Reading Comprehension and Word Study Skills.

[b]Comprised of the summed Concepts About Print items as follows:

Book Orientation - items 1, 2 and 11.

Print Direction - items 3, 4, 5, 6, 7, 8, 9 and 16.

Letter/Word - items 8, 19, 21, 22, 23, 24.

Advanced Print - items 10, 12, 13, 14, 15, 17, 18 and 20.

Table 2

Percentage of Total Subjects Answering Each CAPT Item Correctly

Item		Percentage of Subjects
BOOK ORIENTATION CONCEPTS		
1	Identifies front of book	95
2	Print (not picture) carries meaning	100
11	Left page before right	100
PRINT-DIRECTION CONCEPTS		
3	Starts top left	100
4	Moves left to right	100
5	Return sweep to next line	100
6	Matches spoken to written word	98
7	First and last (lines, words or letters)	98
9	Movement along inverted print	96
16	Identifies period	86
LETTER-WORD CONCEPTS		
8	Recognizes inverted picture	99
19	Identifes upper/lower case letters	97
21	Identifies one and two letters	91
22	Identifies one and two words	94
23	Identifies first and last letter in a word	93
24	Identifies capital letter	93

Table 2 (continued)

ADVANCED-PRINT CONCEPTS		
10	Recognizes inverted lines	57
12	Recognizes incorrect word sequence	14
13	Recognizes incorrect letter sequence	19
14	Recognizes incorrect letter sequence	18
15	Identifies question mark	75
17	Identifies comma	33
18	Identifies quotation marks	34
20	Distinguishes between was/saw and no/on	86
N =		118

Table 3

Percentage of Males and Females Answering Each CAPT Item Correctly

Item		M	F
BOOK ORIENTATION CONCEPTS			
1	Identifies front of book	93	97
2	Print (not picture) carries meaning	100	100
11	Left page before right	98	100
PRINT-DIRECTION CONCEPTS			
3	Starts top left	100	100
4	Moves left to right	100	100
5	Return sweep to next line	100	100
6	Matches spoken to written word	98	98
7	First and last (lines, words or letters)	98	98
9	Movement along inverted print	95	97
16	Identifies period	84	87
LETTER-WORD CONCEPTS			
8	Recognizes inverted picture	100	98
19	Identifes upper/lower case letters	96	97
21	Identifies one and two letters	86	94
22	Identifies one and two words	93	95
23	Identifies first and last letter in a word	95	92
24	Identifies capital letter	93	94

Table 3 (continued)

ADVANCED-PRINT CONCEPTS			
10	Recognizes inverted lines	48	65
12	Recognizes incorrect word sequence	13	15
13	Recognizes incorrect letter sequence	16	21
14	Recognizes incorrect letter sequence	16	19
15	Identifies question mark	73	77
17	Identifies comma	32	34
18	Identifies quotation marks	30	37
20	Distinguishes between was/saw and no/on	88	84
N=		56	62

Table 4

Zero Order Intercorrelation[a] Matrix for all Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	-	.058	-.330	-.017	.017	.108	-.075	.033	-.097	.016	-.219	-.081	-.127
2. Gender		-	-.157	-.043	-.172	-.061	-.102	-.103	-.120	-.055	-.034	-.103	-.112
3. Otis-Lennon			-	.492	.498	.466	.563	.523	.013	.196	.334	.425	.480
4. Word Reading				-	.811	.818	.537	.943	.000	.283	.261	.549	.568
5. Reading Comprehension					-	.762	.477	.933	.014	.285	.202	.533	.537
6. Word Study Skills						-	.507	.912	.018	.342	.184	.525	.539
7. Vocabulary							-	.543	.041	.206	.214	.454	.465
8. Total Reading								-	.011	.322	.233	.576	.589
9. Book Orientation									-	-.038	-.064	.134	.148
10. Print-direction										-	.240	.244	.489
11. Letter/Word											-	.228	.549
12. Advanced Print												-	.906
13. CAPT Total													-

[a] r = .181 required for p = .05 and r = .236 for p = .01 with df = 116 for a two-tailed test.

Table 5

Stepwise Regression of CAPT on Reading Subtests of SAT and OLSAT

Best 2-Variable Source	df	SS Added to Residual if Removed	B	F	p	R^2
Regression	2			34.70	.0001	.376
Word Reading		85.488	.107	26.79	.0001	
Otis-Lennon		31.263	.041	9.80	.002	
Residual	115					

Best 3-Variable Source	df	SS Added to Residual if Removed	B	F	p	R^2
Regression	3			24.04	.0001	.387
Word Reading		59.212	.095	18.73	.0001	
Otis-Lennon		16.548	.033	5.24	.024	
Vocabulary		6.557	.066	2.07	.152	
Residual	114					

Best 4-Variable Source	df	SS Added to Residual if Removed	B	F	p	R^2

Table 5 (continued)

Regression	4			18.51	.0001	.395
Otis-Lennon		15.077	.031	4.79	.030	
Word Reading		13.067	.066	4.15	.043	
Vocabulary		5.461	.061	1.74	.190	
Word Study Skills		4.876	.047	1.55	.215	
Residual	113					

Note: The first F value in each column is the significance for the overall two, three or four variable model.

Table 6

Zero and First Order Partial Correlations Between the CAPT and Reading Subtests of SAT with OLSAT Controlled

Subtest	Zero order	Explained variance	First order	Explained variance
1. Word Reading	.568	32.2[a]	.434	18.8
2. Reading Comprehension	.537	28.8	.391	15.2
3. Word Study Skills	.539	29.0	.406	16.4
4. Vocabulary	.465	21.6	.267	7.1

Note: All correlations significant, $p < .01$.

[a]Numbers indicate percentage.

Table 7

Zero and First Order Partial Correlations Between the OLSAT and CAPT with Subtests of the SAT Controlled

Zero order	Explained variance	Subtest controlled	First order	Explained variance
.480	23[a]	1. Word Reading	.279	7.7
		2. Reading Comprehension	.290	8.4
		3. Word Study Skills	.307	9.4
		4. Vocabulary	.296	8.7

Note: All correlations significant, $p < .01$.

[a]Numbers indicate percentage.

Table 8

Comparison of Above and Below Average Readers on Means of Concept Measures and Otis-Lennon Following a Significant MANOVA

Variable	Above Average (N = 52)		Below Average (N = 51)		
	M	SD	M	SD	t
1. Book Orientation	2.94	.26	2.92	.27	.41
2. Print-direction	6.88	.32	6.67	.65	2.14*
3. Letter/Word	5.81	.63	5.59	.73	1.64
4. Advanced Print	4.23	1.53	2.37	1.41	6.40**
5. Otis-Lennon	113.88	13.12	101.12	12.56	5.04**

* $p < .05$

** $p < .01$

Table 9

Canonical Correlation and Standardized Regression Coefficients of CAPT Concept Scores and Reading Subtests of the SAT

Variable	B	R	R^2	F	p
CONCEPT SCORES					
Book Orientation	-.061	.634	.402	4.232	.0001
Print direction	.266				
Letter-Word	.133				
Advanced Print	.859				
READING SUBTESTS					
Word Reading	.293				
Reading Comprehension	.287				
Word Study Skills	.278				
Vocabulary	.308				

Note: All subsequent canonical R's are nonsignificant.

Table A

Comparison of Percentage of Males and Females Answering Each CAPT Item Correctly

Item		Present Study		Day et al.(1980b)	
		M	F	M	F
BOOK ORIENTATION CONCEPTS					
1	Identifies front of book	93	97	100	100
2	Print (not picture) carries meaning	100	100	96	100
11	Left page before right	98	100	100	100
PRINT-DIRECTION CONCEPTS					
3	Starts top left	100	100	96	100
4	Moves left to right	100	100	100	100
5	Return sweep to next line	100	100	96	100
6	Matches spoken to written word	98	98	93	96
7	First and last (lines, words or letters)	98	98	93	96
9	Movement along inverted print	95	97	78	96
16	Identifies period	84	87	82	88
LETTER-WORD CONCEPTS					
8	Recognizes inverted picture	100	98	85	88
19	Identifes upper/lower case letters	96	97	93	92
21	Identifies one and two letters	86	94	96	100
22	Identifies one and two words	93	95	78	88
23	Identifies first and last letter in a word	95	92	74	96
24	Identifies capital letter	93	94	30	46

Table A (continued)

ADVANCED-PRINT CONCEPTS					
10	Recognizes inverted lines	48	65	30	42
12	Recognizes incorrect word sequence	13	15	30	42
13	Recognizes incorrect letter sequence	16	21	30	62
14	Recognizes incorrect letter sequence	16	19	26	42
15	Identifies question mark	73	77	70	83
17	Identifies comma	32	34	33	46
18	Identifies quotation marks	30	37	11	21
20	Distinguishes between was/saw and no/on	88	84	78	88
N=		56	62	27	24

Table B

Comparison of Percentage of Total Subjects Answering Each CAPT Item Correctly in Three Studies

Item		Present Study Total	Total[a]	Total[b]
BOOK ORIENTATION CONCEPTS				
1	Identifies front of book	95	100	100
2	Print (not picture) carries meaning	100	98	100
11	Left page before right	100	98	100
PRINT-DIRECTION CONCEPTS				
3	Starts top left	100	98	100
4	Moves left to right	100	100	100
5	Return sweep to next line	100	98	100
6	Matches spoken to written word	98	94	93
7	First and last (lines, words or letters)	98	94	93
9	Movement along inverted print	96	86	87
16	Identifies period	86	84	80
LETTER-WORD CONCEPTS				
8	Recognizes inverted picture	99	86	90
19	Identifes upper/lower case letters	97	92	92
21	Identifies one and two letters	91	98	88
22	Identifies one and two words	94	90	93
23	Identifies first and last letter in a word	93	82	92
24	Identifies capital letter	93	84	83

Table B (continued)

ADVANCED-PRINT CONCEPTS				
10	Recognizes inverted lines	57	37	35
12	Recognizes incorrect word sequence	14	35	22
13	Recognizes incorrect letter sequence	19	45	32
14	Recognizes incorrect letter sequence	18	33	32
15	Identifies question mark	75	76	77
17	Identifies comma	33	39	32
18	Identifies quotation marks	34	16	18
20	Distinguishes between was/saw and no/on	86	82	72
N =		118	51	60

Note: Factor pattern previously identified by Day and Day (Note 5).

[a]Data from Day, Day, Spicola & Griffen (1981), April testing.

[b]Data from Johns (1980), May testing.